A HUMAN FACTOR IN STRIP MINING: TRADE-OFFS BETWEEN ATTITUDES AND OPINIONS TOWARD THE INDUSTRY IN OHIO[1, 2]

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ABSTRACT

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The industry is shown as operating in a relatively negative social milieu when the affective and cognitive components of attitudes toward the industry in a sample population of the State were ananlyzed. Eighty percent of the population revealed negative affective attitudinal components toward strip mining. However, when this population was asked to state their opinions on the concept and supply a reason for them, the response pattern represented by this cognitive component of attitudes did not correspond to the affective component. This difference was significant. Stability of attitudes which were negative toward the industry, as indicated by consistency in the affective and cognitive components, persisted in approximately one-third of the sample population. Another group, about equal in number, had attitudes in an unstable state as revealed by the differences in their affective and cognitive components. A third group hesitated to express in opinion on strip mining. The majority of this group had a negative affective attitudinal component. The study revealed that approximately one-third of the population sampled had stable negative attitudes toward strip mining.

Our society is very dependent upon the extractive industries which operate to provide us with many of the amenities we enjoy. Most of these we have learned to anticipate without giving much, if any, thought to their sources. Certainly we should give some consideration to the fact that a major portion of our gross national product results from the functioning of our mineral industry. Yet, much of our present affluence depends upon the existence of the industry. Mining provides the basic materials from which our appliances, automobiles, airplanes, buildings, and homes are constructed. Mining also provides the major portion of inanimate energy by which our vehicles transport us and our buildings and homes remain functional and habitable. More precisely, we tend to flip a light switch, turn on an appliance, start the automobile, or board an airplane with little or no conscious thought of the source of the energy causing these items to become functional devices.

We tend to develop feelings toward certain economic activities involving the extraction and processing of minerals into useful products. These feelings are generally less than positive, even though we have come to expect a never-ending flow of energy and amenity items, and they are constantly being modified by our cumulative experience with these activities (Fishbein, 1967). Experiences may be direct or indirect and involve changing costs of energy, difficulty or ease in obtaining items of convenicne, alteration of familiar objects and landscapes, and modification of the atmosphere and our water resources. These are a few general areas of a host of items and activities, associated in some way with the extractive industries, about which we have accumulated these experiences. At any moment, these experiences may cause persons in sufficient numbers to behave in an organized fashion (or result in the collective expression of opinions by groups of citizens) which may have an impact upon one or more of the extractive

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industries. Such activities may result in some far-reaching actions affecting many more persons than those stimulated into organized action or expression by their experiences. When such action is observed, or determined to be imminent, it is useful to examine the nature of the social milieu in which the action occurs.

Strip mining is an economic activity which extracts a mineral fuel to satisfy growing demands for energy in several parts of our nation. The industry has generally operated in a manner that has attracted the attention of the public in several ways. Individuals and groups have been led to give conscious consideration to the broad effects of this extractive process. In Ohio, the industry has been subjected to periodic efforts to have stripping of coal regulated and to cause existing regulations to be intensified. These efforts have presisted for more than twenty-five years, and invariably resulted from both direct and indirect experiences of the population with the operation of the industry. Generally, these experiences were related to the alteration of familiar landscapes and insults to the water resource, but other experiences are easily identified.

Five times since the passage of Ohio's first strip mining legislation in 1947, there have been successful attempts to intensify the regulation of the industry. In each instance a common enemy, strip mining, was perceived by a segment of the population stimulated to move for additional regulation and control of stripping operations in Ohio. The most recent of these efforts resulted in a revision of the Ohio law in April, 1972. As this effort was developing, a study of a sample of the population of Ohio was made to determine something of the nature of the social environment in the State as it related to the strip mining industry (Ray, 1972).

STUDY METHOD

The area from which the sample group was selected includes four counties (Coshocton, Richland, Wyandot and Henry) extending northwesterly from a group of three counties (Harrison, Jefferson and Belmont) in east central Ohio (defined as the core area of strip mining in the State), and four counties (Perry, Pickaway, Greene and Butler) extending southwesterly from this core (figure 1). The counties

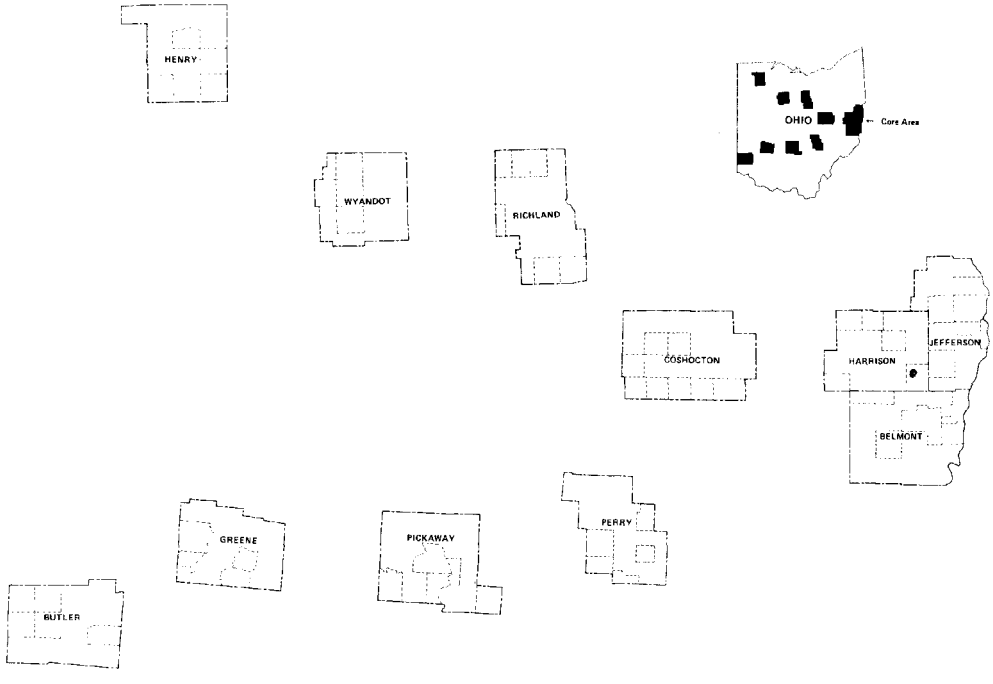

FIGURE 1. Sampling areas for attitudes and opinions on strip mining in Ohio. Spot in Harrison County shows geographical center of core area.

comprising the core area were the major producers of strip-mined coal in all but two years in the decade, 1961–70 (Development Department, 1969; Ohio Department of Industrial Relations, 1967–70). Counties were selected to produce a spatial bias in the sample and thus assist in providing a cross-section of the population in the State. To further pursue this effort, approximately one-third of the townships in each of the counties were used as data collection areas. The townships were randomly selected using a random numbers table and a list of townships arranged alphabetically by county. These townships are listed in table 1. For temporal and financial reasons, the maximum number of completed interviews in a township were limited to nine persons. This limitation of the number of persons interviewed in each country was influenced by the number of townships included and the intention to interview an approximately equal number of persons in the counties where strip mining existed (Belmont, Coshocton, Harrison, Jefferson and Perry) and those where this activity was absent.

TABLE 1

Townships representing data collection units and number of respondents by county

County	Townships	Respondents
Belmont*	Flushing	9
	Goshen	9
	Pease	9
	Pultney	9
	Richland	9
Butler	Hanover	9
	Libery	9
	Milford	9
	Reily	9
Coshocton*	Bethlehem	6
	Franklin	6
	Jefferson	6
	Linton	6
	Perry	6
	Virginia	6
	Washington	6
Greene	Beaver Creek	9
	Caesar's Creek	9
	New Jasper	9
	Sugar Creek	9
Harrison*	Archer	9
	Freeport	9
	Monroe	9
	North	9
	Short Creek	9
Henry	Bartlow	9
	Harrison	9
	Pleasant	9
	Richfield	9
Jefferson*	Island Creek	9
	Knox	9
	Salem	9
	Smithfield	9
	Steubenville	9
Perry*	Coal	8
	Harrison	8
	Jackson	8
	Monday Creek	8
	Pleasant	8
Pickaway	Circleville	7
	Jackson	7
	Perry	7
	Salt Creek	7
	Wayne	7
Richland	Blooming Grove	6
	Cass	6
	Jefferson	6
	Plymouth	6
	Sandusky	6
	Worthington	6
Wyandot	Crawford	9
	Mifflin	9
	Richland	9
	Salem	9

*Counties producing strip-mined coal.

Permission to conduct the study in the 11 counties were personally sought from the Office of the Sheriff in each jurisdiction. From this location, using county roadmaps, the shortest route through each group of townships was determined. Following this, the effort was to interview the person appearing in response to a knock on the door of every second residence along the selected route. When the established number of interviews for each township was completed the next township on the route was entered and the process repeated. In this manner, 432 interviews were completed, providing the data for analysis in this study.

To assess the nature of the social milieu, a questionnaire and an attitude scale (see appendix) were developed for use in assembling data on the sample population. One section of the questionnaire provided information on selected economic and social variables for the sample. Analysis of selected data from the questionnaire revealed that the population possessed a rather broad range of economic and social characteristics. Because it was impossible from the data available on these variables to characterize the sample, it was considered to be representative of the total population of Ohio.

A Thurstone Paired Comparisons Scale was constructed for measuring the direction of human attitudes toward strip mining for coal (fig. 1). Traditionally, attitudes are defined as being three-dimensional—i.e., they have an affective, cognitive, and behavioral component. The affective component is defined by a person's feedlings toward a concept. The cognitive component consists of the perceptions, beliefs, and ideas one possesses about a concept. The term "opinion" is often used as a surrogate for the cognitive component. The behavioral component of attitudes consists of the tendency to act or react toward a concept in certain ways (Mann, 1969).

The Thurstone Scale was prepared and tested according to the rules outlined by Edwards (1957)—i.e., items were selected and scaled following a mathematical model, and the agreement of the data with the model was verified

by procedures incorporated in the scaling process. Scoring was accomplished by assigning each of the respondents the median of the scale values they endorsed, thus respondents were placed at positions on the psychological continuum established by this scale of favorableness toward strip mining. The *Paired Comparisons Scale* is primarily designed to measure the strength and direction of respondent's feeling toward a concept (Rosenberg *et al.*, 1963), and provides information for an evaluation of the affective component of attitudes toward the concept.

Another section of the questionnaire allowed respondents to be asked directly to state their personal opinion on strip mining. These opinions were recorded as positive, neutral, or negative. Respondents were then asked why they held the opinion they had stated and these reasons were included in the data set. Data in the form of attitude scale scores, representing a measure of the affective component, and stated opinions, representing the cognitive component of attitudes toward strip mining, were thus available for analysis. With the data in this form, it has been possible to examine partially the nature of the social environment in which the strip-mining industry operated in Ohio. A comparison of the measured feeling toward strip mining with the stated opinions on the concept has revealed three types of responses to the industry from the sample population at a time when the an effort to intensify the regulation of the industry was being initiated.

ANALYSIS OF DATA

Tables 2, 3, and 4 provide a grouping of the affective and cognitive components

TABLE 2

Respondents with measured attitudes consistent with stated opinions on strip mining for coal in Ohio.

Median Scale Scores	Scale Score Interpretations	Respondents	Number of Stated Opinions			
			Positive	Neutral	Negative	Ratio Opinions to Attitudes
.216	Very Positive	57	47	0	0	.825
.434	Positive	6	1	0	0	.167
.637	Neutral	22	0	3	0	.136
.935	Negative	166	0	0	89	.536
1.045	Very Negative	181	0	0	52	.287
Total		432	48*	3*	141*	——

*48+3+141=192; 44.4% of total sample.

TABLE 3

Respondents with measured attitudes opposite to stated opinions on strip mining for coal in Ohio

Median Scale Scores	Scale Score Interpretations	Respondents	Number of Stated Opinions			
			Positive	Neutral	Negative	Ratio Opinions to Attitudes
.216	Very Positive	57	0	0	6	.105
.434	Positive	6	0	0	3	.500
.637	Neutral	22	4	0	15	.864
.935	Negative	166	42	0	0	.253
1.045	Very Negative	181	69	0	0	.381
Total		432	115*	0	24*	——

*115+24=139; 32.2% of total sample.

TABLE 4

Measured attitudes of respondents compared with stated neutral opinions on strip mining for coal in Ohio.

Median Scale Scores	Scale Score Interpretations	Respondents	Neutral Opinions	Ratio Opinions to Attitudes
.216	Very Positive	57	4	.070
.434	Positive	6	2	.333
.637	Neutral	22	*	*
.935	Negative	166	35	.211
1.045	Very Negative	181	60	.332
Total		432	101**	——

*These data are given in Table 2.
**23.4% of total sample.

of attitudes toward strip mining in Ohio. These data suggest that efforts being made to intensify regulation of the industry occurred at a time when the affective component of attitudes toward strip mining within the population of Ohio was negative. It can be stated that a majority of the sample, 347 persons (80.0%) had negative feelings toward the activity —i.e., there were 181 persons with *very negative* and 166 with *negative* feelings as measured by the Thurstone Scale. Only 63 persons, (15.0%) recorded *very positive* and *positive* feelings twoard the industry. There were 22 persons, (5.0%) who recorded *neutral* feelings toward strip mining for coal.

With respect to the cognitive component of attitudes toward the industry, there were 165 persons (38.2%) who expressed *negative* opinions on strip mining, 163 persons, (37.7%) who stated *positive* opinions; and 104 persons, or (24.1%) who assumed a *neutral* stance on the concept (tables 2, 3, 4).

These summaries suggest that there is a discrepancy in the affective and cognitive components of attitudes in the sample population toward strip mining. The data on the two components of attitude were subjected to a Chi Square test to determine if the differences noted in the sample were significant. A Chi Square of 62.3 was computed for the proportions of the components and with $df=4$ this value this far exceeds the value for Chi Square at the .01 level of significance indicating a valid difference in the affective and cognitive components of attitude toward strip mining in the sample.

There is evidence of a consistency in the components of attitude within a relatively large proportion of the sample (table 2). When the affective and cognitive components of attitude are consistent, the attitude is in a stable state (Rosenberg *et al.* 1963). There were 192 persons, (44.4%), who revealed consistency in their feelings and opinions toward strip mining. Of this group there were 141 persons, (32.6%), who revealed a *negative* set of attitudinal components. These persons were not willing to trade off the perceived liabilities of strip mining for the assets which the industry could provide.

One hundred and thirty-nine persons, (32.2%), revealed an inconsistency in their attitudinal components. Of these individuals there were 111, (25.7%), who had a *negative* feeling toward the concept, but expressed a *positive* opinion on strip mining, showing an instability in their attitudes (Rosenberg *et al.* 1963).

It is evident that another group from the sample had an unstable attitudinal dimension. These were the 101 persons, (23.4%), that had either *positive* or *negative* feelings toward the industry, but refused to state an opinion, pro or con, on strip mining. Of this group there were 95 persons, (22.0%), who recorded a *negative* affective component. Yet, their *neutral* stance with respect to the cognitive component suggests that their experiences with the industry were different from those in the other two groups. Based upon reasons given by respondents for stating *positive* or *negative* opinions, it is suggested that these

95 persons could not, or did not, at the moment of the interview, elect to critically evaluate the assets offered by the availability fuel and economic opportunity where stripping is practiced, and the liabilities of damaged landscapes and polluted waters.

CONCLUSIONS

Interest groups in Ohio were successful in promoting legislation, effective in April, 1972, which increased the restrictions under which the strip mining industry operates in the State. A part of the nature of the social environment in which these efforts were conducted, prior to the establishment of the new regulatory law, is described above.

In the summer of 1970, a measure of the affective and cognitive components of attitudes toward strip mining were taken from a sample population in Ohio. The study revealed that there were inconsistencies in attitudinal components. Such inconsistency represents a condition of instability in human reactions toward the industry with about one-fourth of the sample revealing negative affective and positive cognitive attitudinal components. These persons possessed negative feelings toward strip mining, but did not hesitate to recognize and state their preference for the assets provided by strip mining to the liabilities associated with the activity. Slightly more than one-fifth of the sample population presented a negative affective attitudinal component but failed to reveal a cognitive element. In time, the feelings and opinions of these two groups toward strip mining may move toward a stable condition, with these two attitudinal components becoming consistent (Rosenberg *et al.*, 1963). About one-third of the sample group had stable negative attitudes toward the industry. This group had negative feelings and stated negative opinions toward strip mining. There was consistency in the affective and cognitive components of their attitudes. These persons possessed negative feelings toward strip mining, and did not hesitate to state their recognition of the failure of the assets of strip mining to outweigh the liabilities they associated with the activity.

Analysis of the data collected suggests that interest groups and individuals actively seeking to increase the amount of regulation and control of strip mining in Ohio were functioning at a time when approximately one-thrid of the population of the State had attitudes compatible with their activities to establish a more rigorous control of the industry. Only about one-tenth of the study population presented stable attitudes which could be identified as opposed to the efforts of those interested in regulation of the industry.

APPENDIX

ATTITUDE SCALE FOR STRIP MINING FOR COAL

In responding to this schedule you are asked to select THREE of the seven statements given below which are most acceptable to you, or with which you could most readily agree.

Instructions;

Place a check mark (X) in the blank space to the left of THREE of the seven statements below which are most acceptable to you, or with which you can most readily agree. It is essential for you to respond to AT LEAST THREE, but NO MORE THAN THREE of the statements. Failure to respond in this manner will greatly reduce the value of your response to us.

Please begin your judgment of the statements below:

(.000) Strip mining provides benefits for individuals and the community for which the coal companies are not rewarded.

(1.278) Any judgment of the social value of strip mining should be a matter of balanced thinking.

(.216) We should reward and acclaim those who are capable of extracting a profit from coal lying beneath the surface.

(1.045) One should be very concerned about the amount of land taken out of agricultural and recreational use by strip mining.

(.434) Strip mining should be halted because it produces serious damage to a familiar landscape.

(.935) One should not destroy what he cannot recreate.

(.637) Strip mining for coal is properly described as a "rape of the land."

Note: Scale scores, given here in parentheses for each stimuli, were not included in the field version of the scale.

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ANNOUNCEMENTS

A new section of The Ohio Academy of Sciences is being organized. Individuals or institutions interested in ADMINISTRATIVE SCIENCES AND PLANNING please contact Frank J. Costa, Center for Urban Studies, University of Akron, Akron, Ohio 44325.

Analysis of Ecological Systems. Third Annual Colloguium of the College of Biological Sciences. 30 April–1 May, 1976. Biologists should be particularly interested in this *free* conference, organized by David J. Horn, Gordon R. Stairs and Rodger Mitchell. For more information, write: Colloquium, College of Biological Sciences, The Ohio State University, 484 West 12th Avenue, Columbus, Ohio 43210.